AP CALCULUS PROBLEM SET 3 ANSWER KEY

1. a) $\frac{dy}{dx} = \frac{-2x-y}{x+2y}$

   b) at $x = \pm\sqrt{27}$, $\frac{dy}{dx} = -2$, tangent lines at x-intercepts are parallel

   c) (−6, 3), (6, −3)

2. a) $\frac{dy}{dx} = \frac{-(y+1)}{x+4y}$

   b) $y-1 = -\frac{1}{3}(x-2)$

   c) (6, −3)

3. a) $\frac{dy}{dx} = \frac{1}{1-\sin y}$

   b) $x = \frac{\pi}{2} - 1$

   c) $\frac{d^2y}{dx^2} = \frac{\cos y}{(1-\sin y)^3}$

4. a) $xy^2 - x^3y = 6$

   $(1)y^2 + 2y\frac{dy}{dx}(x) - \left(3x^2y + \frac{dy}{dx}\left(x^3\right)\right) = 0$

   $\frac{dy}{dx}(2yx) - \frac{dy}{dx}\left(x^3\right) = -y^2 + 3x^2y$

   $\frac{dy}{dx} = \frac{-y^2+3x^2y}{2yx-x^3} = \frac{3x^2y-y^2}{2yx-x^3}$

   b) (1, 3) $y = 3$
   (1, −2) $y = 2x-4$

   c) $x = (-24)^{\frac{1}{5}}$

5. a) $\frac{dy}{dx} = \frac{16x-5y}{5x+3y^2}$

   b) $y = 3x - 13$

   c) $y \approx -0.4$

   d) $y^3 + 21y + 7.88 = 0$ or
   $100y^3 + 2100y + 788 = 0$

   e) $k = -0.373$

6. a) $y = \frac{1}{4}x + \frac{5}{4}$

   b) The tangent line is vertical at (3, −1)

   c) $\frac{d^2y}{dx^2} = \frac{1}{32}$